

Listing of the Claims:

The following is a listing of all claims in this application, with an indication of the status of each, and a strikethrough and underlining to show changes:

- 1 1. (Currently Amended) An image comparison system
2 ~~characterized by~~ comprising:
3 ~~threedimensional data input~~ means for inputting input
4 three-dimensional data of an object;
5 reference image storing means for storing a reference image
6 of at least one reference object;
7 pose candidate deciding means for generating a plurality of
8 pose candidates ~~at least one pose candidate as a candidate for pose~~
9 ~~of the object~~;
10 comparison image generating means for generating, for the
11 reference image for the at least one object, a at least one
12 comparison image close to the reference image, said generating
13 including while projecting the three-dimensional data onto a two-
14 dimensional image in accordance with each of the plurality of pose
15 candidates to generate a plurality of comparison images and
16 calculating, for each of the plurality of comparison images, the
17 minimum distance between the comparison image and the
18 reference image and selecting, as the comparison image close to
19 the reference image, the comparison image having the smallest
20 minimum distance; and
21 image comparing means for performing comparison on the basis
22 of one of a distance value and a similarity degree between the reference
23 image and the generated comparison image and, based on the

24 comparison, identifying whether a match exists between the generated
25 comparison image and the reference images.

1 2. (Currently Amended) ~~The An~~ image comparison system of
2 ~~according to claim 1, characterized in that~~ wherein said image
3 comparing means ~~comprises:~~
4 ~~selecting means for selecting one of a minimum distance~~
5 ~~value which is a smallest distance value and a maximum~~
6 ~~similarity degree which is a largest similarity degree; and~~
7 identifies whether a match exists based on comparing means for
8 ~~performing comparison on the basis of one of a result of comparison~~
9 ~~between the minimum distance value~~ between the reference image and
10 the generated comparison image and a threshold value and a result of
11 comparison between the maximum similarity degree between the
12 reference image and the generated comparison image and a threshold
13 value.

1 3. (Currently Amended) ~~The An~~ image comparison system of
2 ~~according to claim 1, characterized in that~~
3 wherein said reference image storing means stores a
4 reference image for each of a plurality of objects,
5 wherein said comparison image generating means generates,
6 for each of the reference images, a comparison image close to each
7 the reference image, and
8 said image comparing means comprises:
9 calculating means for calculating, for each of the
10 reference images, one of a distance value and a
11 similarity degree between the each reference image and the
12 generated comparison image close to the reference image;

13 selecting means for selecting, for each of the
14 reference images, one of a minimum distance value which is
15 a smallest distance value and a maximum similarity degree
16 which is a largest similarity degree for each reference
17 image; and
18 comparing means for outputting, as a comparison result,
19 one of a reference image including a smallest minimum distance
20 value which is a smallest one of minimum distance values and a
21 reference image including a largest maximum similarity degree
22 which is a largest one of maximum similarity degrees.

1 4. (Currently Amended) The ~~An~~ image comparison system of
2 ~~according to~~ claim 1, ~~characterized by~~ further comprising:
3 reference correction coefficient storing means for storing a
4 correction coefficient corresponding to the reference image; and
5 correcting means for correcting one of the minimum distance
6 value and the maximum similarity degree based on ~~by using~~ the
7 correction coefficient.

1 5. (Currently Amended) The ~~An~~ image comparison system of
2 ~~according to~~ claim 1, ~~characterized by~~ further comprising reference
3 weighting coefficient storing means for storing a weighting
4 coefficient corresponding to the reference image,
5 said image comparing means comprising calculating means for
6 calculating one of the distance value and the similarity degree between
7 the reference image and the comparison image based on ~~by using~~ the
8 weighting coefficient corresponding to the reference image.

1 6. (Currently Amended) The ~~An~~ image comparison system of

~~according to claim 1, characterized by~~ further comprising:

standard three-dimensional reference point storing means
for storing a standard three-dimensional reference point
corresponding to a standard three-dimensional object model;
standard three-dimensional weighting coefficient storing
means for storing a standard three-dimensional weighting
coefficient;

three-dimensional reference point extracting means for
extracting a three-dimensional reference point from the input
three-dimensional data; and

input weighting coefficient converting means for obtaining a
coordinate correspondence of the standard three-dimensional
weighting coefficient to the three-dimensional data based on ~~by~~
~~using~~ the standard three-dimensional reference point and the
three-dimensional reference point of the three-dimensional data,
and converting the standard three-dimensional weighting
coefficient into a two-dimensional weighting coefficient in
accordance with the pose candidate,

said image comparing means comprising calculating means for
calculating one of the distance value and the similarity degree between
the reference image and the comparison image based on ~~by using~~ the
converted two-dimensional weighting coefficient.

7. (Currently Amended) The An image comparison system of

~~according to claim 1, characterized by~~ further comprising:

representative three-dimensional object model storing
means for storing representative ones of three-dimensional object
models as representative three-dimensional object models;

group storing means for storing related information of the

7 representative three-dimensional object models and reference
8 images;
9 three-dimensional comparing means for comparing the
10 input three-dimensional data with the representative three-
11 dimensional object models, and selecting a representative three-
12 dimensional object model similar to the three-dimensional data;
13 and
14 reference image selecting means for selecting a reference
15 image corresponding to the selected representative three-
16 dimensional object model by referring to the related information,
17 wherein said image comparing means compares the selected
18 reference image with the input three-dimensional data.

1 8. (Currently Amended) The ~~An~~ image comparison system of
2 ~~according to claim 1, characterized by~~ further comprising:
3 representative image storing means for storing
4 representative ones of images as representative images;
5 group storing means for storing related information of the
6 representative images and reference images;
7 representative image selecting means for comparing the
8 input three-dimensional data with the representative images, and
9 selecting a representative image similar to the three-dimensional
10 data; and
11 reference image selecting means for selecting a reference
12 image corresponding to the selected representative image by
13 referring to the related information,
14 wherein said image comparing means compares the selected
15 reference image with the input three-dimensional data.

1 9. (Currently Amended) The An image comparison system of
2 ~~according to~~ claim 4, wherein characterized in that the correction
3 coefficient is determined on the basis of at least one of a distance
4 value and a similarity degree between a representative three-
5 dimensional object model and the reference image.

1 10. (Currently Amended) An image comparison method for
2 identifying a match of an object to a stored reference image of at
3 least one object, characterized by comprising the steps of:
4 inputting input three-dimensional data of an object;
5 generating at least one pose candidate as a candidate for
6 pose of the object;
7 generating, for the reference image of the at least one object,
8 a at least one comparison image close to the reference image, said
9 generating including while projecting the three-dimensional data
10 onto a two-dimensional image in accordance with each of the
11 plurality of pose candidates to generate a plurality of comparison
12 images and calculating, for each of the plurality of comparison
13 images, the minimum distance between the comparison image and
14 the reference image and selecting, as the comparison image close
15 to the reference image, the comparison image having the smallest
16 minimum distance; and
17 identifying whether a match exists between the generated
18 comparison image and the reference image, said identifying including
19 performing comparison on the basis of one of a distance value and a
20 similarity degree between the reference image and the generated
21 comparison image.

1 11. (Currently Amended) The An image comparison method of of

2 ~~according to claim 10, wherein characterized in that~~ the step of
3 identifying whether a match exists includes performing
4 ~~comparison comprises the steps of:~~
5 ~~calculating one of the distance value and the similarity~~
6 ~~degree between the reference image and the comparison image;~~
7 ~~selecting one of a minimum distance value which is a~~
8 ~~smallest distance value and a maximum similarity degree which is~~
9 ~~a largest similarity degree; and~~
10 ~~performing comparison on the basis of one of a result of~~
11 comparison between the minimum distance value between the
12 reference image and the generated comparison image and a threshold
13 value and a ~~result of~~ comparison between the maximum similarity
14 degree between the reference image and the generated comparison
15 image and a threshold value.

1 12. (Currently Amended) The An image comparison method of
2 ~~according to claim 10, characterized in that~~
3 wherein the step of generating a comparison image comprises the
4 step of generating a comparison image close to each reference image for
5 each of a plurality of objects; and
6 wherein the step of identifying whether a match exists
7 ~~performing comparison~~ comprises the steps of:
8 calculating, for each of the reference images, one of a distance
9 value and a similarity degree between the each reference image and the
10 generated comparison image close to the reference image;
11 selecting, for each of the reference images, one of a minimum
12 distance value which is a smallest distance value and a maximum
13 similarity degree which is a largest similarity degree for each reference
14 image; and

15 outputting, as a comparison result, one of a reference image
16 including a smallest minimum distance value which is a smallest one of
17 minimum distance values and a reference image including a largest
18 maximum similarity degree which is a largest one of maximum
19 similarity degrees.

1 13. (Currently Amended) The An image comparison method of
2 ~~according to~~ claim 10, ~~characterized by~~ further comprising the step of
3 correcting one of the minimum distance value and the maximum
4 similarity degree based on by using a correction coefficient
5 corresponding to the reference image.

1 14. (Currently Amended) The An image comparison method of
2 ~~according to~~ claim 10, wherein characterized in that the step of
3 identifying whether a match exists performing comparison comprises
4 the step of calculating one of the distance value and the similarity
5 degree between the reference image and the comparison image based
6 on by using a weighting coefficient corresponding to the reference
7 image.

1 15. (Currently Amended) The An image comparison method of
2 ~~according to~~ claim 10, ~~characterized by~~ further comprising the
3 steps of:
4 extracting a three-dimensional reference point from the
5 input three-dimensional data; and
6 obtaining a coordinate correspondence of a standard three-
7 dimensional weighting coefficient to the three-dimensional data by
8 using a standard three-dimensional reference point corresponding
9 to a standard three-dimensional object model and the three-

10 dimensional reference point of the three-dimensional data, and
11 converting the standard three-dimensional weighting coefficient
12 into a two-dimensional weighting coefficient in accordance with
13 the pose candidate,
14 wherein the step of identifying whether a match exists comprises
15 ~~performing comparison comprising~~ the step of calculating one of the
16 distance value and the similarity degree between the reference image
17 and the comparison image based on ~~by using~~ the converted two-
18 dimensional weighting coefficient.

1 16. (Currently Amended) The An image comparison method of
2 ~~according to~~ claim 10, ~~characterized by~~ further comprising the
3 steps of:
4 comparing the input three-dimensional data with
5 representative three-dimensional object models which are
6 representative ones of three-dimensional object models, and
7 selecting a representative three-dimensional object model similar
8 to the three-dimensional data; and
9 selecting a reference image corresponding to the selected
10 representative three-dimensional object model by referring to
11 information indicating relations between the representative three-
12 dimensional object models and reference images,
13 wherein the step of identifying whether a match exists
14 ~~performing comparison comprises comprising~~ the step of comparing the
15 selected reference image with the input three-dimensional data.

1 17. (Currently Amended) The An image comparison method of
2 ~~according to~~ claim 10, ~~characterized by~~ further comprising the step
3 of:

4 comparing the input three-dimensional data with
5 representative images which are representative ones of images,
6 and selecting a representative image similar to the three-
7 dimensional data; and
8 selecting a reference image corresponding to the selected
9 representative image by referring to information indicating
10 relations between the representative images and reference images,
11 wherein the step of identifying whether a match exists comprises
12 ~~performing comparison comprising~~ the step of comparing the selected
13 reference image with the input three-dimensional data.

1 18. (Currently Amended) The An image comparison method of
2 ~~according to~~ claim 13, ~~characterized by~~ further comprising the step of
3 determining the correction coefficient on the basis of at least one of a
4 distance value and a similarity degree between a representative three-
5 dimensional object model and the reference image.

1 19. (Currently Amended) A computer readable medium storing a
2 computer program that, when executed by the computer, causes
3 the for causing a computer to execute:

4 a procedure of inputting ~~input~~ three-dimensional data of
5 an object;

6 a procedure of generating at least one pose candidate as a
7 candidate for pose of the object;

8 a procedure of generating, for the reference image of the at
9 least one object, a at least one comparison image close to the
10 reference image, said generating including while projecting the
11 three-dimensional data onto a two-dimensional image in
12 accordance with each of the plurality of pose candidates to

13 generate a plurality of comparison images and calculating, for each
14 of the plurality of comparison images, the minimum distance
15 between the comparison image and the reference image and
16 selecting, as the comparison image close to the reference image,
17 the comparison image having the smallest minimum distance; and
18 a procedure of identifying whether a match exists between
19 the generated comparison image and the reference image, said
20 identifying including performing comparison on the basis of one of
21 a distance value and a similarity degree between the reference
22 image and the generated comparison image.

1 20. (Currently Amended) The computer readable storage medium
2 of A program according to claim 19, wherein the computer
3 program, when executed by the computer in the procedure of
4 identifying whether a match exists performing comparison, the
5 program causes the computer to execute:
6 a procedure of ~~calculating one of the distance value and the~~
7 ~~similarity degree between the reference image and the comparison~~
8 ~~image;~~
9 a procedure of ~~selecting one of a minimum distance value~~
10 ~~which is a smallest distance value and a maximum similarity~~
11 ~~degree which is a largest similarity degree; and~~
12 a procedure of ~~performing comparison on the basis of one of a~~
13 ~~result of comparison between the minimum distance value between the~~
14 reference image and the generated comparison image and a threshold
15 value and a ~~result of comparison between the maximum similarity~~
16 degree between the reference image and the generated comparison
17 image and a threshold value.

1 21. (Currently Amended) The computer readable storage medium
2 of A program according to claim 19, wherein the computer
3 program, when executed by the computer in the procedure of
4 generating a comparison image, ~~the program~~ causes the computer
5 to execute a procedure of generating a comparison image close to
6 each reference image for each of a plurality of objects, and
7 in the procedure of identifying whether a match exists
8 ~~performing comparison, the program~~ causes the computer to
9 execute:
10 a procedure of calculating, for each of the reference images,
11 one of a distance value and a similarity degree between the each
12 reference image and the generated comparison image close to the
13 reference image;
14 a procedure of selecting, for each of the reference images,
15 one of a minimum distance value which is a smallest distance
16 value and a maximum similarity degree which is a largest
17 similarity degree for each reference image; and
18 a procedure of outputting, as a comparison result, one of a
19 reference image including a smallest minimum distance value which is
20 a smallest one of minimum distance values and a reference image
21 including a largest maximum similarity degree which is a largest one of
22 maximum similarity degrees.

1 22. (Currently Amended) The computer readable storage medium of A
2 ~~program according to claim 19, wherein the computer program, when~~
3 executed by the computer ~~which~~ further causes the computer to execute
4 a procedure of correcting one of the minimum distance value and the

5 maximum similarity degree based on ~~by using~~ a correction coefficient
6 corresponding to the reference image.

1 23. (Currently Amended) The computer readable storage medium of A
2 ~~program according to claim 10, wherein the computer program, when~~
3 executed by the computer in the procedure of identifying whether a
4 match exists, performing comparison, the program causes the computer
5 to execute a procedure of calculating one of the distance value and the
6 similarity degree between the reference image and the comparison
7 image by using a weighting coefficient corresponding to the reference
8 image.

1 24. (Currently Amended) The computer readable storage medium
2 of A ~~program according to claim 19, wherein the computer~~
3 program, when executed by the computer ~~which~~ further causes the
4 computer to execute:
5 a procedure of extracting a three-dimensional reference
6 point from the input three-dimensional data; and
7 a procedure of obtaining a coordinate correspondence of a
8 standard three-dimensional weighting coefficient to the three-
9 dimensional data by using a standard three-dimensional reference
10 point corresponding to a standard three-dimensional object model
11 and the three-dimensional reference point of the three-dimensional
12 data, and converting the standard three-dimensional weighting
13 coefficient into a two-dimensional weighting coefficient in
14 accordance with the pose candidate,
15 wherein in the procedure of performing comparison, the program
16 causes the computer to execute a procedure of calculating one of the
17 distance value and the similarity degree between the reference image

18 and the comparison image by using the converted two-dimensional
19 weighting coefficient.

1 25. (Currently Amended) The computer readable storage medium
2 of A program according to claim 19, wherein the computer
3 program, when executed by the computer which further causes the
4 computer to execute:

5 a procedure of comparing the input three-dimensional data
6 with representative three-dimensional object models which are
7 representative ones of three-dimensional object models, and
8 selecting a representative three-dimensional object model similar
9 to the three-dimensional data; and

10 a procedure of selecting a reference image corresponding to
11 the selected representative three-dimensional object model by
12 referring to information indicating relations between the
13 representative three-dimensional object models and reference
14 images,
15 wherein in the procedure of performing comparison, the program
16 causes the computer to execute a procedure of comparing the selected
17 reference image with the input three-dimensional data.

1 26. (Currently Amended) The computer readable storage medium
2 of A program according to claim 19, wherein the computer
3 program, when executed by the computer which further causes the
4 computer to execute:

5 a procedure of comparing the input three-dimensional data
6 with representative images which are representative ones of

7 images, and selecting a representative image similar to the three-
8 dimensional data; and
9 a procedure of selecting a reference image corresponding to
10 the selected representative image by referring to information
11 indicating relations between the representative images and
12 reference images,
13 wherein in the procedure of performing comparison, the program
14 causes the computer to execute a procedure of comparing the selected
15 reference image with the input three-dimensional data .

1 27. (Currently Amended) The computer readable storage medium of A
2 program according to claim 22, wherein the computer program, when
3 executed by the computer which further causes the computer to execute
4 a procedure of determining the correction coefficient on the basis of at
5 least one of a distance value and a similarity degree between a
6 representative three-dimensional object model and the reference image.